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Title: Operation Ivy

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Operation Ivy

Operation Ivy, a two-shot test program, included the United States' first thermonuclear device, Mike; and King, its highest yield fission bomb. Mike, if successful, held the promise of future weapons having megaton yields. King, pushing the limits of a fission design, provided a high yield alternative should Mike fail.

Ivy				
Name	**Date**	**Location**	**HOB**	**Yield (Mt)**
Mike	1/11/1952	Elugelab	Surface	10.4
King	1/16/1952	Runit	1,480	0.5

Hollywood assisted the Atomic Energy Commission in capturing the final hours and minutes leading up to Mike. Actor Reed Wilson and a camera crew had free rein of the USS Estes, the command and control ship for the operation. Hadley's smooth camera presence contrasted sharply with those of the scientists and technicians he interviewed. As the final countdown began, Hadley put on dark goggles as Mike exploded with a blinding force of 10.4 megatons.[1]

Watching a seismograph in the basement of the geology building at the Berkeley campus of the University of California, Edward Teller knew within minutes that Mike had detonated. "At exactly the scheduled time," said Teller, "I saw the light point move. The sound waves took

[1] *Operation Ivy Motion Picture*.

twenty minutes to carry the message under the Pacific to Berkeley."[2] Gordon Dean, Chairman of the AEC, waited until evening to inform President Truman. In a very guarded conversation required by secrecy rules, Dean told the President, "On the matter which I discussed with you the other evening this is simply to report that the mission was carried out with highly successful results. I'm doing everything possible to keep this info from becoming public until after Tuesday [Election Day]." Truman was pleased to hear the news. As Dean recorded in his office diary, the president said, "he appreciated the situation and thanks a lot."[3]

Mike became theoretically possible because of two discoveries made fourteen years earlier. The first discovery was that stellar temperatures fused hydrogen atoms into helium, releasing a portion of the binding energy that holds hydrogen nuclei together. If stellar temperatures could be produced on earth, a thermonuclear bomb of incredible destructive potential was possible. The second discover, fission, provided the means of doing just that.[4] Throughout the following fourteen years, Los Alamos and other organizations conducted countless experiments to engineer these two discoveries into Mike. One such experiment, the George test of Operation Greenhouse, ignited a thermonuclear reaction. However, radiation cooling, known as the Inverse Compton Effect, soon extinguished the reaction.[5] The answer to

[2] Edward Teller and Judith Schoolery. Edward Teller: Memoirs – A Twentieth Century Journey in Science and Politics (Cambridge, Massachusetts: Perseus Publishing, 2001), 352; Edward Teller, The Legacy of Hiroshima (Garden City, NY.: Doubleday, 1962), 55; and Richard Rhodes, Dark Sun: The Making of the Hydrogen Bomb (New York: Simon & Schuster, 1995), 511.

[3] Gordon E. Dean and Roger Anders, Forging the Atomic Shield: Excerpts from the Office Diary of Gordon E. Dean (Chapel Hill: University of North Carolina Press, 1987), 229-230; and Richard Hewlett, Atomic Shield, 592- 593. The President was campaigning for Adlai Stevenson.

[4] Hans Bethe, "*Energy Production In Stars*," Nobel Acceptance Speech as printed in *Science,* Vol., 161, No. 3841 (August 9, 1968), 541-547; and Sybil Parker: *McGraw-Hill Dictionary of Scientific and Technical Terms*.

[5] Ann Fitzpatrick, "Igniting the Light Elements: The Los Alamos Thermonuclear Program, 1942-1952, LA-13577-T, 40.

this problem was to channel the energy of the radiation produced by a fission bomb to compress and ignite deuterium. This process, radiation implosion, provided the key to the final design of Mike.

Mike was a stunning success. The thermonuclear era had arrived. On board the Estes, Hadley and his shipmates watched Mike's mushroom cloud push well into the stratosphere. Hours later, observers flying in helicopters saw only deep blue water where the island of Elugelab had once been. Mike's success, however, had a hidden consequence not revealed until the 1954 Castle Bravo event. Only five percent of Mike's expected radioactive fallout was accounted for. This condition led some scientists to theorize that the other ninety-five percent was injected into the stratosphere, where it remained because a condition known as stratospheric trapping. Bravo's fallout, which fell throughout the Marshall Islands with dire consequences, disproved stratospheric trapping.

Fifteen days after Mike, King, detonated high over Runit Island with a yield of 500 kilotons. Delivered by a giant B-36 bomber, King became the largest yield fission device tested by the United States.[6] Its high yield came at a cost. The bomb was very large, technically complex, and not particularly safe. Its only value as an alternative to Mike evaporated along with Elugelab.

[6] DOE/NV -209, Rev 16.